THE JOURNAL OF
THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
(Including Transactions)

Volume 36 AUGUST 1914 Number 8

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C 55. The Society as a body is not responsible for the statements of facts or opinions advanced in papers or discussions.

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COMING MEETINGS OF THE SOCIETY

September 8, *San Francisco, Cal.* Subject: Hydroelectric Power Development in Conjunction with that of Domestic Water Supply.

November 18, *New Haven, Conn.* Fall meeting with afternoon and evening sessions, Mason Laboratory of Mechanical Engineering, Sheffield Scientific School, Yale University. Subject: The Generation and Application of Electricity in Manufacturing.

Annual Meeting, December 1–4, *New York City.* There will be a session on Engineering Metals, particularly Steels of Construction and for Tools; Cast Irons; and Alloys of Copper, Tin and Aluminum, etc.; and the entire day on Thursday, December 3, will be devoted to the general subject of the Engineer in Public Service, taking up problems in municipal engineering which are of interest to the mechanical engineer. The sub-committees on Railroads and Machine Shop Practice are arranging for sessions, and there will undoubtedly be groups of papers given under the direction of other committees, besides one session at which several important miscellaneous papers will be read.

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PUBLIC SERVICE AT THE ANNUAL MEETING

Some years ago the Constitution of the Society was amended to provide for a Committee on Public Relations, to have charge of those activities of the Society which include service to the public other than that rendered directly to the individual members and to the profession as a whole.

In furtherance of this idea the Public Relations Committee announces that Public Service has been designated by the Committee on Meetings as the central theme for the Annual Meeting in December 1914. At the request of the Committee, the Public Relations Committee has taken charge of the program for Thursday, December 3, and it will be devoted to papers on municipal engineering and related matters. The session will be opened by John Purroy Mitchel, Mayor of the City of New York, and the following papers, among others, will be presented during the day, according to a schedule to be arranged later:

Snow Removal, a Report of the Committee on Resolutions of the Snow Removal Conference held in Philadelphia, April 16-17, 1914.

Utilization of Municipal Wastes, by Irwin S. Osborne, designer and operator of the Columbus, O., Garbage Disposal Plant, and consulting engineer of the cities of Philadelphia, New York, Washington, D.C., and Toronto, Canada.

The Training of Municipal Employees, by H. M. Waite, City Manager, Dayton, O.

The Cleaning of Public Buildings, by Wm. H. Ball, Chief, Bureau of City Property, Philadelphia.

The Future of the Police Arm, by Henry Bruére, City Chamberlain, New York City, and Director of the National Bureau of Municipal Research.

Controlling Factors in Municipal Engineering, by Morris L. Cooke, Director, Dept. of Public Works, Philadelphia.

A Study of Cleaning Filter Sands, by Sanford E. Thompson, Consulting Engineer, Newton Highlands, Mass.

Municipal Colleges in Germany, by Clyde L. King, Instructor in Political Science, University of Pennsylvania, Philadelphia.

The Design and Operation of the Cleveland Municipal Electric Light Plant, Frederick W. Ballard, Commissioner of Lighting, Dept. of Public Utilities, Cleveland, Ohio.

This program only suggests the scope to be covered and further papers from our membership are requested.

The Society feels that it has a great opportunity in welcoming to its membership the growing body of engineers who are now engaged in putting the administrative work of our cities on an engineering basis. Branches of municipal work which but a few years ago were considered as having no engineering significance have assumed such proportions and are conducted along such lines as make imperative the employment of technically trained men. It is suggested by the Committee that this is an opportune time to present short memoranda, covering not more than two pages, outlining any recent changes in the conduct of different kinds of municipal work, which tend to put them upon an engineering basis and which may have come under the observation of our members.

IMPORTANT HEARING ON BOILER SPECIFICATIONS

Attention is called to the hearing to be held in the rooms of the Society on September 15 at 10 a.m., at which arguments and suggestions are to be presented upon the proposed report of the Committee to Formulate Standard Specifications for the Construction of Steam Boilers and other Pressure Vessels and for Care of Same in Service.

This report promises to be one of the most important ever issued by the Society. A large number of copies of a tentative draft of the report have already been sent to individual engineers, qualified to pass judgment upon it, and many helpful suggestions have been made. At the hearing in September, it is expected that accredited representatives of a number of organizations will appear, so that when the report finally comes up for discussion at the Annual Meeting, it will represent the concerted efforts of many able engineers and be in a form that will be generally acceptable to societies interested in steam boiler construction.

AN OPPORTUNITY FOR WORK[1]

It is only occasionally that we have an opportunity to discuss together what we as a Society are doing, and I am glad of the occasion to do so.

Membership in this Society should have as its purpose the opportunity for work rather than any personal benefit which may be derived, and we should all have an increasing sense of responsibility and privilege to render service.

All our committees, such as for instance the Boiler Specifications Committee, whose efforts have been the subject of discussion at this meeting, are doing zealous work, and such effort and loyalty to their profession is to be commended.

The committee whose work is continually being brought before you is the Publication Committee, and they, with the office staff, are endeavoring constantly to make our publication the best mechanical engineering paper in the field. This means, of course, a great deal of effort in editorial work and policy. I want to touch upon a point of controversy which has arisen through the attempt of the committee and the Council to direct the Society's efforts along what they consider the most intelligent line.

Only in America do technical societies publish two sets of publications, weekly or monthly or quarterly, and at the end of the year a bound volume in addition. Every German and every Frenchman and every Englishman saves his journals as a matter of course and has them bound up, if he wishes them, at the end of the year, and all but four or five societies in America do likewise. We are one of those four or five extravagant societies that present each member with a complete set of journals and at the end of the year a handsome bound volume in half morocco. The Council, after considerable thought on the matter, felt justified in wishing to divert the money spent in piling up such a set of books for the sentimental satisfaction involved, into what they considered more useful channels, but it has not worked out as the Council and Committee hoped. This evidently has not been properly put before the membership, as the Publication Committee and the Council are confident the membership would approve. Some of the other uses for the money now going into Transactions would be such work as the advancement of committee activities such as that of the Boiler Specifications Committee. The limited edition of the code which was issued for preliminary distribution cost $3000, and it must be obvious that this is only a beginning. A similar amount has been spent by the committee members themselves in their zeal to carry the work through. This is a customary thing in other societies, to have the members spend their own money in a public spirited way for the profession, but our own members are only beginning to realize that it is a privilege to spend their own money and their own time for the benefit of the profession. Mr. Stott, the chairman of the Flange Committee, has spent several years' time and great labor and expense in preparing charts to show a system by which flanges for high-pressure piping may be designed, and have some continuity of design. Because it is customary for the Society as such to pay for all the cost of committee work we are constantly pressed for funds.

We have seventy-five committees in the Society at work in different ways, and the Council and the Publication Committee have thought that the $15,000 which it costs for a duplicate set of publications might more wisely be spent in the development of the committee work.

We are also developing a library and a library service, so that those at a distance may derive benefit from the best technical library in the country. This is being done through searches, covering references to current articles upon any given subject, the charge for which is simply the actual cost of the labor involved in preparing the copy. This copy can be supplied either in the form of the magazines themselves, purchased by the library, or may be a typewritten transcription or a photographic reproduction of the articles.

During the coming Annual Meeting we are to have an entire session on the Relations of the Engineer to the Public, conducted by our Committee on Public Relations. Mr. Morris L. Cooke, director of public works at Philadelphia, has been instrumental in securing the most expert men available in the country to speak on subjects pertaining to engineering in the administration of a city.

This Society, with four others, has invited over 350 engineering societies of the world to come to America next year and unite with us in our celebration of the great engineering achievement, the completion of the Panama Canal, and over 175 of these have accepted. We were royally entertained in Germany last summer, not only by the Verein, but by Germany as a nation and by the various municipalities, as no society has ever been entertained before. Before that, in 1910, we were shown exceptional courtesies in England, and further back still, France was our host, so that we owe these foreign engineers the best we can give them. We have formed a joint reception committee, and Dr. Alex. C. Humphreys and Mr. Walter M. McFarland are respectively its general chairman and vice-chairman. This committee will need the coöperation of all our membership wherever they are situated in showing these engineers the hospitality of the various cities and extending to them the welcome of the profession. All these things mean participation in a large way in the affairs of the nation and the occupation of the place which we, as engineers, are striving to attain, namely, the position of national influence. I want to say that our Society is doing things all the time, and that

[1] Remarks made by Calvin W. Rice, Secretary, at the Spring Meeting, St. Paul, Minneapolis, 1914.

it is a good Society to be a member of. But I wish to emphasize that our position as engineers individually, as a Society, or as a profession, will be in direct proportion to the service which we render to the community in which we live, to the profession of which we are a Society, and to our great country of which we are citizens.

CALVIN W. RICE, *Secretary.*

A CALL FOR SPEAKERS

An invitation is extended to the members of the Society to volunteer their services to address the Student Branches during the coming season. Thirty-two of the leading colleges and technical schools of the country at present have associations which are affiliated with the Society and hold stated meetings under its jurisdiction. Most of the branches hold monthly meetings from October to May, and it is customary to have experts in various lines of engineering and industrial activity give talks or lectures at these meetings on some subject of current interest.

The Society undertakes to assist in the preparation of programs for each of its Student Branches and the rapid growth in the number of branches in the past few years makes it increasingly difficult to locate a sufficient number of speakers.

A generous response from the members to the invitation is anticipated, and it is requested that those who reply indicate the topics with which they are most familiar. Programs are already being formulated and a prompt response is therefore solicited. Members wishing to volunteer their services should communicate with the Secretary.

INTERNATIONAL ELECTRICAL CONGRESS

The purpose of the forthcoming International Electrical Congress in San Francisco in 1915 is twofold: the bringing together of a large and representative body of electrical engineers from all over the world, who shall find interest and inspiration in the Congress; and the erecting in its published transactions of a notable milestone of electrical engineering progress and development as a permanent record of contemporaneous electrochemical achievement. These published transactions will be available to members of the Congress at such a low price that either in part or as complete sets they will be within reach of all. Those who may be unable to attend the Congress may find a large measure of participation through possession of the transactions.

The meetings will be divided into twelve sections and there will probably be thirteen volumes in the complete set of its transactions, as follows:

(1) Generation, Transmission and Distribution
Central station and substation design, control and operation. Long distance transmission of electric power.

(2) Apparatus Design
Generators, motors and transformers. The rating of machinery.

(3) Electric Traction and Transportation
City, surface and rapid transit railways; interurban and trunk lines; electric vehicles, ship propulsion, mining railways, elevators, and hoists.

(4) Electric Power for Industrial and Domestic Use
Factories, mills, refrigeration, heating devices, etc.

(5) Lighting and Illumination
Arc and incandescent lighting; the science and art of illumination.

(6) Protective Devices; Transients
Switches, circuit breakers; condensers; electrostatics; disruptive phenomena; high-frequency phenomena.

(7) Electrochemistry and Electrometallurgy
Electrolytic and metallurgical apparatus and processes.

(8) Telegraphy and Telephony
(*a*) All communication of intelligence by the use of wires. (*b*) Electromagnetic waves and radiotelegraphy and telephony.

(9) Electrical Instruments and Electrical Measurements
Switchboard, portable, standard and absolute instruments. Testing and standardization methods; absolute measurements.

(10) Central Station Economics
Load factors, power factors, measurement of maximum demand and all problems affecting the economy of central stations; also rates, their regulation and legislation.

(11) Electrophysics
Radioactivity; Röntgen rays; gas and vapor conduction; electron theory; constitution of matter, etc.

(12) Miscellaneous
Such as history and literature of electrical engineering; symbols and nomenclature; engineering education and ethics.

(13) General Congress Proceedings

Communications may be addressed to
PRESTON S. MILLAR, Secretary-Treasurer
80th Street and East End Avenue
New York, N. Y.

PUBLICATION PLANS OF THE INSTITUTION OF MECHANICAL ENGINEERS

The Institution of Mechanical Engineers of Great Britain has taken an important step in the establishment of a monthly Journal, the first issue of which appeared in June. In size of page and typographical appearance it follows substantially the style of the pamphlet papers regularly issued by the Institution in advance of meetings.

The particularly interesting feature of this first number is an announcement of the new publication plans of the Institution. For many months the council has had under consideration methods of bringing into closer touch with the work of the organization those members who are resident in the country or abroad, and who are consequently unable to attend the meetings regularly. The outcome was the establishment of the Journal and an arrangement for binding that part of it which constitutes the Proceedings or Transactions; together with the advance printing of papers in pamphlet form, to be sent out upon request to members desiring them. In all particulars the plan is like that recommended also by the Publication Committee and Council of The American Society of Mechanical Engineers, and it is pleasing to note that the two societies, through the investigations of separate and independent committees, arrived at the same conclusions.

An examination of the present issue of the Journal shows that it is divided into two parts, each with an independent pagination. Part one contains information such as notices of coming meetings. In this particular instance, the program of the July-Paris meeting of the Institution, with abstracts of the papers to be presented, is given. By perusing these any member can judge whether or not a paper deals with matters in which he is interested or on which he desires to present a discussion, and if this should be so, a copy of the paper will be sent him.

Part two is of a different character and contains the full text of the papers presented at the previous meeting, together with the discussion so far as it can be completed up to the time of going to press. In the next issue following, the first place will be given to the completion of this discussion and the author's reply. This will be followed by the text of the next paper read, etc.

The Institution in various ways is enhancing the value of membership to those residing outside of London, and it is expected that arrangements will be made by which papers will be read simultaneously in other cities at the same time they are presented in London. Recent improvements in the house of the Institution will aid materially in this work. Through the acquisition of additional land, an enlargement of the building has been made. The main staircase has been widened and the ground floor now provides ample accommodations for the secretary and his staff in the new part of the building. On the mezzanine floor above these offices, a spacious committee room is to be found, and the council room is now located on the first floor, opening into one wing of the library. On the third floor a reading room and a smoking room for the members have been added. The design for the enlargement was made by Mr. James Millar of Glasgow, also the architect for the building of the Institution of Civil Engineers which faces that of the Mechanical Engineers on Princes Street, the frontages of the two buildings being rather similar in character.

OPENING OF THE NEW SOCIETY HOUSE OF THE VEREIN DEUTSCHER INGENIEURE

On June 5 the new society house of the Verein deutscher Ingenieure was opened with appropriate exercises, at which The American Society of Mechanical Engineers was represented by Frank B. Gilbreth, who was appointed Honorary Vice-President by the Council for this occasion. The new building is a magnificent structure, finished in the most substantial manner and utilized solely for the work of the Verein.

The proximity of the Imperial House of Representatives on the one hand, and the Brandenburg Gate on the other, imposed on the architects the difficult problem of designing a building in keeping with these two structures. This problem was solved in an admirable manner and the effect of large and impressive spaces is secured by connecting the windows of the first and second floors and maintaining the effect of vertical lines by suitable treatment of the walls, with crowns over the windows of the upper floors. Between the windows is a notable series in bas relief of the heads of famous German engineers, designed by Hugo Lederer.

Former Home of the Verein deutscher Ingenieure

On the ground floor is a spacious entrance hall and staircase, the main part of this floor, however, being unused at present and reserved for the future needs of the society. The feature of the building is the main meeting hall on the next floor, where are also several committee rooms. The main hall is decorated by a series of mural paintings, one of which is a view of Alexisbad in the Harz Mountains, where fifty-eight years ago twenty-three young engineers founded the

Verein. Another panel shows the Technical High School of Berlin and another the German Museum at Munich. At one end is an allegorical painting typifying engineering.

Two upper floors are devoted respectively to general offices for conducting the affairs of the Society, and the editorial and literary work and drafting connected with its publications, which form so important an element of the work of the Verein.

In a very high degree the Verein deutscher Ingenieure is what its name implies, the Society of German Engineers. While there are active and well patronized societies of electrical and mining engineers, practically every German engineer desires to become associated with the parent society. At the end of 1913 it had a membership of 24,500, more than a thousand times its charter list.

THE NEW HOUSE OF THE VEREIN DEUTSCHER INGENIEURE

The influence of the Verein, as a bond between German engineers, extends far beyond the geographical confines of the German Empire. In addition to forty-eight local sections there are several recently created foreign branches, in Austria, England, China and in this country. These sections are practically autonomous. They have their own constitutions approved by the parent body, their own governing councils, may select honorary members, and receive a certain share of the dues paid in by their members. A local section may be formed, with the approval of the Verein council, by not less than 150 members of the organization.

The activities of the Verein extend considerably beyond the limits of mere reading of papers and discussions. Through its committees and funds, but above all through the hearty collaboration between its members and the organizations of which they direct the policies, the Verein exercises a potent influence on the development of technical education in Germany, and the standards of engineering research, especially such as is conducted in the laboratories of the splendidly equipped German Technical High Schools. Through its various committees the way is often paved for governmental regulations, and manufacturers are helped to adopt uniform practices in the classification of their output.

The publications of the Verein comprise the weekly Zeitschrift containing both papers presented before the various sections of the Society and contributions by members, as well as the usual editorial departments. The original articles are also available in separate reprints, the price of which is made especially accessible to members and students of engineering schools. As a supplement to the Zeitschrift is published a monthly, Technik und Wirtschaft, the purpose of which is to promote the knowledge of economic and social subjects among engineers. Another important publication is "Communications concerning Researches in the Field of Engineering," consisting of pamphlets appearing at irregular intervals, and presenting the results of researches conducted under the auspices of the Verein, mainly in the laboratories of technical schools. As a rule, extensive summaries of these researches appear in the Zeitschrift some time previous to the publication in complete form in the Communications.

In addition the Verein publishes several series of books, such as Contributions to the History of Engineering and Industry and History of the Verein deutscher Ingenieure.

What is perhaps the most important result of the work of the Verein, however, is of such a nature that it can hardly appear in its official reports; and that is the change in the public opinion concerning the engineering profession in Germany in the last fifty years. For example, Werner von Siemens in his autobiography explains more than once that his social recognition was due to his status as a Prussian officer of artillery, rather than to his success as an engineer and inventor. That this situation prevails no longer and that engineers as such are recognized for their accomplishments and are leaders in public activity is due in large measure to the work of the Verein and the growing influence of its members.

DUTIES AND RESPONSIBILITIES OF THE ENGINEER[1]

By Henry L. Gantt

I wish to take this opportunity to lay before you in a few words, my idea regarding certain duties and responsibilities, which, if I read the signs of the times aright, will rapidly fall upon the shoulders of the engineer. In some quarters the engineer has already assumed these duties and responsibilities; in others, it has not yet been recognized that these duties belong to the engineer; but inasmuch as they are problems affecting our national welfare, and the engineer seems the only man fitted to solve them, there is no question that he will ultimately have to accept the responsibility for their solution.

It has been said that we are an industrial nation. I feel that we are only just beginning to be an industrial nation, and shall not be fully entitled to that name until we have a more complete knowledge of the principles on which successful industry is based. Too many of our enterprises are still founded on *what has been done* rather than on *what can be done*. The real industrial leader must be guided by future possibilities rather than past performances. The growing disposition among the people of all lands to abolish special privileges of every kind, is going to make it necessary for those who carry on industrial operations to depend more and more upon their own efficiency, and to get away as rapidly as possible from the errors of past practice. We can no longer blindly follow the trail of those who have gone before simply because they were successful. What spelled success yesterday, may spell failure tomorrow. Knowledge, not precedent or opinion, must be our guide. The man whose special training fits him to acquire the necessary knowledge is the engineer: he works with facts which he obtains by investigation; others are usually guided by opinion, which is too often inherited or copied.

Beginning as a designer of power plants, the mechanical engineer has become the most important factor in our development as an industrial nation. Content at first to design and install plants and equipment, he has realized that it was equally his function to operate them efficiently. This realization is the origin of the present widespread interest in the art of management, which is simply an attempt to apply to the subject of management the methods which the leading engineers have already so successfully applied to that of design. It is only natural that in the attempt to make such an application, the degree of success will, at first, largely depend upon the ability and training of the engineer undertaking the problem, but the day will come when the principles underlying the managing mechanism for an industry *will be as clearly defined and as well understood as those underlying the design of a steam engine, or an electric generator.* It is the function of the engineer to discover or develop these principles. This is not an easy job, for the human factor is the prime one to be considered, and many well-intentioned people have not yet learned that the man in overalls does not differ essentially from the man in the silk shirt.

During our visit to Germany last summer the high estimation in which the engineer was held in that country was evident on all sides. There, he is looked up to for the solution of all their industrial problems, and is no doubt largely responsible for the rapid industrial progress of that nation. Recognizing the importance of the educated engineer, and realizing that unless he had equal rank with other professional men, he would not have the influence that he should have, the Germans invented the degree of Doctor of Engineering, and bestowed it liberally, with the result that the new profession soon took rank with the older professions in the estimation of the people, and we found many of the highest civic positions held by the leading engineers. What could be more appropriate in an industrial nation?

The greatest industrial problem before us as a nation today is the relation between employer and employee. Congress has recognized this fact by appointing a commission to study the subject, and to recommend legislation. This commission, before whom I had the honor of testifying not long ago, is composed of very intelligent and capable men, and one woman whose insight and sympathies are very keen. On this commission the manufacturer, the lawyer, the economist, the philanthropist and the labor leader are to be found, but there is no engineer. Can we have any better evidence that the people at large have not yet discovered the engineer, or that they do not know what his function is?

How are we to bring to the attention of our legislators the fact that there are people in the community whose business it is to investigate and find the solution of industrial problems? Should our local sections not make education on this point one of their duties?

The present unsatisfactory industrial situation is due largely to the fact that most attempts to solve these problems have been made by the financier and the workman, both of whom have attempted to find a solution which would give his class the advantage. Financiers on the one hand, and unionists on the other are thus continually on the verge of a conflict.

What is the solution? Somebody must come between these two and study the subject from an impartial standpoint, and with the object of doing justice to each. The man whose training best fits him for this work is the engineer, and in many cases where he has attacked the problem the results have been most encouraging. With increasing knowledge and experience he promises to make rapid progress in the near future.

If engineers as a class and people in general can be brought to recognize that the engineer is the man best

[1] Address at the opening session of the Spring Meeting, St. Paul, Minn., June 1914.

fitted for solving the problems he has had such a large part in creating, we may hope in a few years to see marked progress toward industrial peace.

APPLICATIONS FOR MEMBERSHIP

Members are requested to scrutinize with the utmost care the following list of candidates who have filed applications for membership in the Society. These are sub-divided according to the grades for which their age would qualify them and not with regard to professional qualifications, i.e., the age of those under the first heading would place them under either Member, Associate or Associate-Member, those in the next class under Associate-Member or Junior, while those in the third class are qualified for Junior grade only. The Membership Committee, and in turn the Council, urge the members to assume their share of the responsibility of receiving these candidates into the Membership by advising the Secretary promptly of anyone whose eligibility for membership is in any way questioned. Members will be furnished with complete records of any candidate thus questioned. All correspondence in regard to such matters is strictly confidential and is solely for the good of the Society, which it is the duty of every member to promote. These candidates will be balloted upon by the Council unless objection is received before September 10, 1914.

FOR CONSIDERATION AS MEMBER, ASSOCIATE OR ASSOCIATE-MEMBER

ADAMS, CONRAD R., Wks. Engr., F. I. A. T. Co., Poughkeepsie, N. Y.

ALMERT, HAROLD, Cons. Engr., The Rookery, Chicago, Ill.

ANDERSON, EMIL C., Mech. Engr., Colorado & Southern Rwy., Denver, Colo.

BASSETT, GEORGE B., Pres. and Genl. Mgr., Buffalo Meter Co., Buffalo, N. Y.

BOCKIUS, CHARLES A., Asst. Mech. Engr., Fuel Testing Co., Boston, Mass.

BOURNE, RALPH H., with Whiting Foundry Equipment Co., Harvey, Ill.

BURNET, TOM, Engr.-in-charge, Bulawayo Water Works Co., Ltd., Bulawayo, So. Africa

BURPEE, FRANK E., Prof. of Mech. Engrg., Bucknell Univ., Lewisburg, Pa.

CARTER, HARRY D., Mech. Engr., Samuel M. Green Co., Springfield, Mass.

CILLEY, RAYMOND, Designing Engr., Troy Wagon Works Co., Troy, Ohio

CLARKE, EDGAR W., Ch. Engr., Cambria Steel Co., Johnstown, Pa.

CLEGHORN, MARK P., Assoc. Prof. Mech. Engrg., Iowa State College, Ames, Ia.

COFFMAN, JOSEPH P., Supt. Dept. Mchy., National Transit Co., Oil City, Pa.

CONRAN, FRED M., Supt., The Torrington Mfg. Co., Torrington, Conn.

CRAMER, VIRGIL P., Experimental Engr., The Garford Co., Elyria, Ohio

CRANE, J. B., Commercial Engr., Great Northern Power Co., Duluth, Minn.

CUTLER, FRANK G., Chief, Bureau of Steam Engrg., Tennessee Coal, Iron & R. R. Co., Ensley, Ala.

DAVIS, FRED R., Ch. Engr., Pwr. Plant, Pittsburgh Plate Glass Co., Kokomo, Ind.

DEAN, HENRY L., Mech. Engr., Compressor Dept., Chicago Pneumatic Tool Co., New York

DODGE, FREDERICK H., Pres., The Ohio Electric Car Co., Toledo, Ohio

DOUGHTY, JOHN H., Mech. Engr., Lehigh & Wilkes-Barre Coal Co., Wilkes-Barre, Pa.

DUNHAM, WALTER E., Supvr., Motive Pwr. and Mchy., Chicago & North Western Rwy., Winona, Minn.

EHRMAN, EDWIN H., Secy. and Factory Mgr., Chicago Screw Co., Chicago, Ill.

ELSAS, OSCAR, Pres., Fulton Bag & Cotton Mills, Atlanta, Ga.

FALES, GEORGE L., Supt. Pwr. Dept., Tennessee Copper Co., Copperhill, Tenn.

FINKLE, FREDERICK C., Cons. Engr. in Mech. and Hyd. Work, Los Angeles, Cal.

FOGARTY, MICHAEL J., Mgr. and Prop., Machine Shop, Brooklyn, N. Y.

FRAUENFELDER, JOSEPH B., Ch. Engr., Lake Torpedo Boat Co., Bridgeport, Conn.

GENTZEL, PERRY H., with The Cincinnati, Bluffton & Chicago R. R., Huntington, Ind.

GILSON, HENRY R., Ch. Engr., National Metal Molding Co., Pittsburgh, Pa.

GLENN, JOHN F., Contr. Engr., The Wickes Boiler Co., Buffalo, N. Y.

GORDON, LEO A., Supvr. Engrg. Dept., City of Fall River, Mass.

GURNEY, HOWARD F., Pres. and Genl. Mgr., Gurney Elev. Co., New York.

HALL, WALTER H., Mech. Supt., Chelsea Fibre Mills, Brooklyn, N. Y.

HAMILTON, JOHN W., Senior Member, Hamilton & Chambers, New York

HANSEN, ANTON, Ch. Draftsman, The Kelly & Jones Co., Greensburg, Pa.

HARTER, CLARENCE J., Ch. Draftsman, Remington Arms-U. M. C. Co., Bridgeport, Conn.

HARTFORD, JOHN A., Secy. and Genl. Mgr., Breese Motor Plow Co., Wapakoneta, Ohio

HAYNES, CHARLES A. R., Asst. Engr., The New York Steam Co., New York

JEWELL, GEORGE H., with Lytton Mfg. Corp., Franklin, Va.

KEATING, THOMAS E., Engr., Turbine Engrg. Dept., The Westinghouse Mch. Co., East Pittsburgh, Pa.

KING, WILLIAM R., Cons. Engr., with S. F. Tainter, New York

KÖTTER, GEORGE, Superintending Engr., Hamburg-American Line, New York

LAINE, WILLIAM B., Engr., American Tobacco Co., New York

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